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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/901,526	07/09/2001	Matthias Forster	INF-1078	7099
24131	7590	11/08/2005	EXAMINER	
LERNER AND GREENBERG, PA P O BOX 2480 HOLLYWOOD, FL 33022-2480			MULPURI, SAVITRI	
			ART UNIT	PAPER NUMBER
			2812	

DATE MAILED: 11/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

AK

Office Action Summary	Application No.		Applicant(s)	
	09/901,526		FORSTER ET AL.	
	Examiner		Art Unit	
	Savitri Mulpuri		2812	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 September 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 12-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 12-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This action is in response to the applicant's communication, filed on
9/8/2005.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for
all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 12-26 are rejected under 35 U.S.C. 103(a) as being unpatentable
over Thakur et al (6,187,628) in combination with Lin et al (US 5,930,625)
and Schaefer et al (US 5,943,571)

Thakur et al discloses a method of growing silicon layer with micro-
roughness of hemispherical growth by the following process steps:

Providing a substrate "12" in a chemical vapor deposition process
chamber, growing polysilicon layer "16" over the substrate; growing thin
oxide layer "18"; generating process gas containing semiconductor
material to grow a rough polysilicon layer "20" in in-situ chemical vapor
disposition. Thakur teaches without annealing the rough silicon layer "20",
growing dielectric layer "20". Thakur et al grows silicon layer in single
growth step exactly similar to what is claimed in instant process. Thakur et
al discloses providing silane gas at growth temperature 500-700 C and
pressure in the range of 70 mTorr to 50 Torr, which includes claimed

range (100mTorr to 600mtorr) to produce rough polysilicon with the thickness in the range of 300 angstroms to 1000 angstroms (see fig.1 and col.3, lines 23-47). Thakur et al further discloses pre-cleaning the substrate in HF prior to growth to inherently provide oxide free surface because HF etches natural oxide deposited on silicon substrate surface (see col.2, lines 7-8). Thakur et al discloses the whole process is applied to form either trench or stacked capacitor for DRAMs (see col.1, lines 24-27). Thakur et al teaches a method of making rough polysilicon in single growth step without annealing step at similar growth conditions as growth conditions recited in instant claimed invention. However, Thakur et al do not teach hydrogen/silane or nitrogen/silane ratio to grow rough polysilicon. Thakur et al discloses forming hemispherical grains in LPCVD on silicon oxide layer "18" using helium diluted silane (20 %) gas.

Lin et al et al discloses forming hemispherical grains with clear spacing in between grains in LPCVD by using either nitrogen at a pressure less than 1 Torr equal to 133 pa), which is with in the claimed range, at a temperature in the range of 550 to 580 C with silane or disilane with a concentration below $1 \text{ E } 10^{-3}$ /molecules/m³, which is heavily diluted with nitrogen (see col.5, lines 2-15). It would have been obvious to one of ordinary skill in the art to form grains with clear spacing to have higher degree of roughness to result more surface area and in turn capacitor with high capacitance for DRAMs.

Lin et al does not mention art recognized equivalent materials of inert nature of nitrogen or helium during hemispherical grain growth.

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Schaefer et al teaches art recognized equivalents of helium or nitrogen to grow spaced apart grains (see fig.1 fig.4 and col.1, lines 41-55). It would have been obvious to one of ordinary skill in the art to grow spaced apart grains using nitrogen as alternative to helium in the invention of Thakur because Schaefer et al teaches art recognized equivalents of He and nitrogen as a carrier gas to grow grains.

Response to Arguments

Applicant's arguments filed on 9/8/2005 fully considered but they are not persuasive. Applicant argues that Thakur et al teaches without removing the substrate from the CVD reactor depositing hemispherical growth(HSG) polysilicon on the silicon oxide layer by CVD, where as Lin et al teaches seeding with silane and annealing in nitrogen for growing grains from the seeds using amorphous silicon, which are not combinable. Applicant presents the excerpts from both Thakur et al and Lin et al for comparison. However, applicant points out unrelated , non-relevant portion in Lin et al, which is about annealing process (col.5, lines 16-24). However, Lin et al is relied on growing HSG with nitrogen as carrier gas as alternative to helium in the invention of Thakur et al (see line et al, col.5, line 2-15 not col.5, 16-24). Obviousness rejection is based on the teaching of Lin et al using carrier gas as nitrogen to dilute silane during growth.

Applicant presents that applicants are at complete loss as to the pertinence of Schaefer. Since Thakur et al teaches He as carrier gas and Lin et al uses nitrogen as carrier gas as independent to each other, Schaefer et al is

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provided just to authenticate using either nitrogen or helium as recognized equivalents to grow HSG (see fig.1 and 4 and col1, lines 41-55).

Applicant et al presents, at page 4, last para, examiner's statement that Thakur et al uses pressure at broad range (70 mTorr to 50 Torr) encompasses applicant's narrow range (100 mTorr to 600 mTorr) and applicant argues that applicant's claim result-oriented process parameters by adjusting the process that semiconductor grains are deposited directing without annealing step to obtain grains with clear spacing between the grains. However, because the crux of the Instant invention and Thakur et al is to obtain capacitor, with large area of the silicon to obtain high capacitance.

Conclusively, Thakur et al at the narrow pressure range as recited in instant invention inherently have spaced grains.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Savitri Mulpuri whose telephone number is 571-272-1677. The examiner can normally be reached on Mon-Fri from 8 to 4.30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Micahel Lebentritt, can be reached on 571-272-1873. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Savitri Mulpuri
Primary Examiner
Art Unit 2812